Climate Change and Agriculture

Tutor notes and handouts for activity 1 and 2

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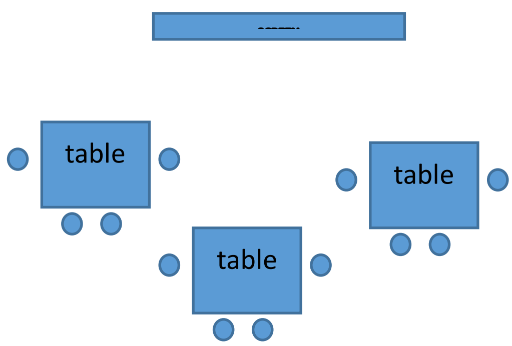
Activity title	**Agriculture: vulnerable to climate change or climate smart?**
Total time needed for activity	2.5- 3hrs
Number of sessions	2
Learning outcome(s)	- Understand the vulnerability of agriculture to climate change and its impacts on crop production particularly rice. - Understand how climate-smart agriculture can help maintain yields under stressful environmental conditions
Brief description of activity (knowledge to be covered and how it will be run)	The activity will be split into 2 sessions. **Session 1: Impacts of climate change on agriculture (~1.5hrs)** Combined lecture and discussion activity session • **Lecture 1:** ~35 min lecture on ***''Vulnerability of agriculture to climate change''***. The impact of increasing temperature and changing rainfall patterns on crop growth & productivity with a focus on rice. • **Activity 1:** ~30-40 min activity: ***''Climate change and Rice- data analysis''*** The group will be split into small groups of 3-4 people. The groups will be given a set of graphs to analyse from published research paper. Tutor can chose their own from recent papers as this session is all about extracting information from figures. *Coffee break- 30 mins*

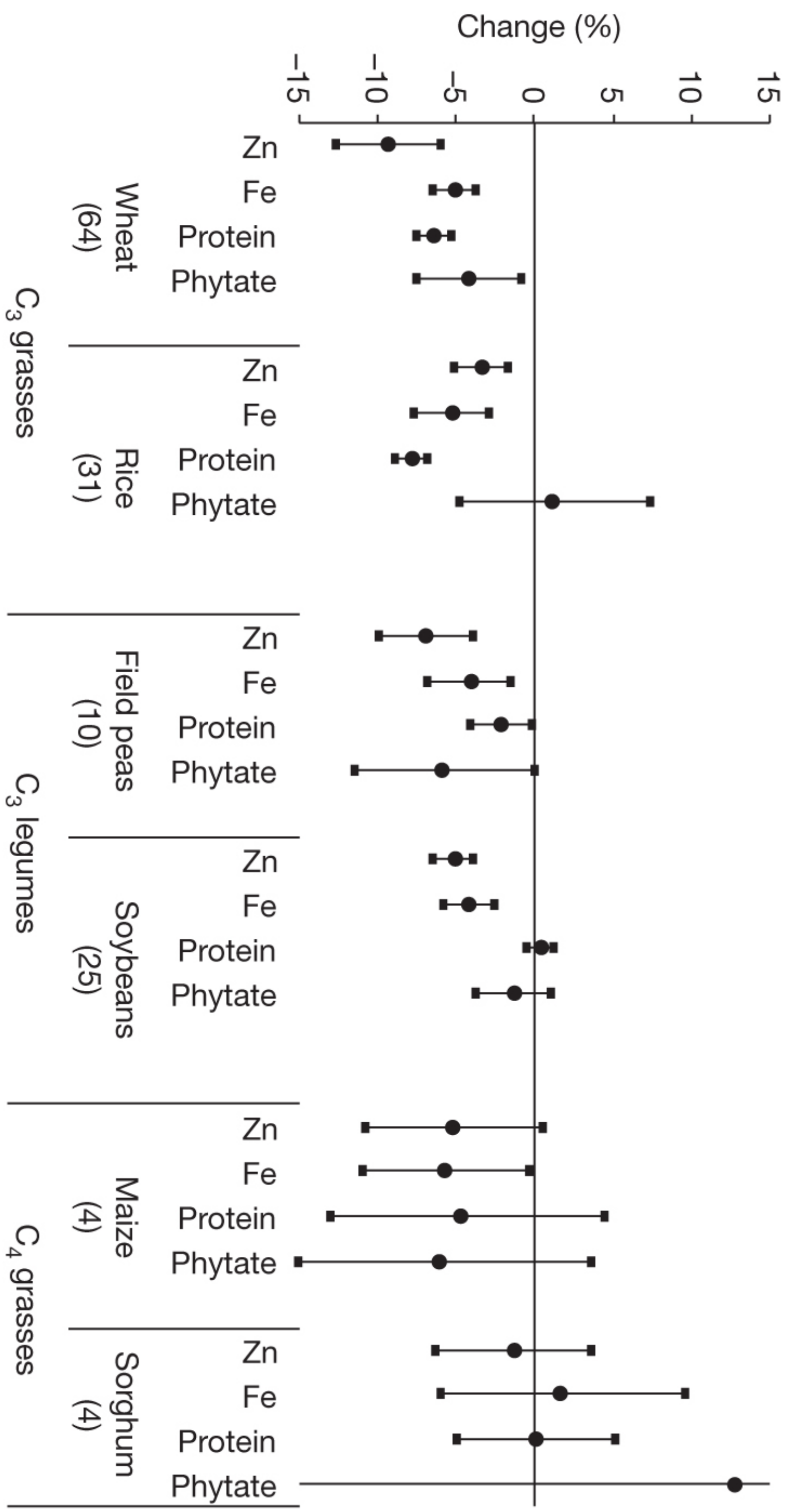
	Session 2: Climate-smart agriculture (~1 hr) Combined lecture and activity session • **Lecture 2:** ~35min lecture on ***''climate-smart agriculture and adaptations to climate change''*.** • **Activity 2:** ~30 min activity: ''P**ictograms poster of climate-smart agriculture solutions''** In small groups discuss ***Climate-smart agriculture* news articles** to create a summary pictogram of solutions to present to rest of group at end of session. Tutors can choose their own to use from the news. It is best to choose ones with a photo for impact to distribute to class. Or ask participants to bring their owns so there is some preparation involved before the session. Each group can have one article or a selection to include on their pictogram. At the send of the session, participants display their pictograms and summarise them to the rest of the class.
Equipment needed	1. Laptop and projector 2. Coloured marker pens or white board markers 3. large sheets of plain paper-A0 or flipchart paper 4. A4 blank paper 5. Handouts of graphs from research paper; 6. Handouts of Climate-smart case studies info sheet from news articles

Suggested seating plan



Activity 1:*''Climate change and Rice- data analysis''* – Handout Fig. 1

Fig. 1 Percentage change in nutrients at elevated [CO_2] relative to ambient [CO_2].



Myers, S. *et al.* Increasing CO_2 threatens human nutrition. *Nature* **510**, 139–142 (2014). https://doi.org/10.1038/nature13179

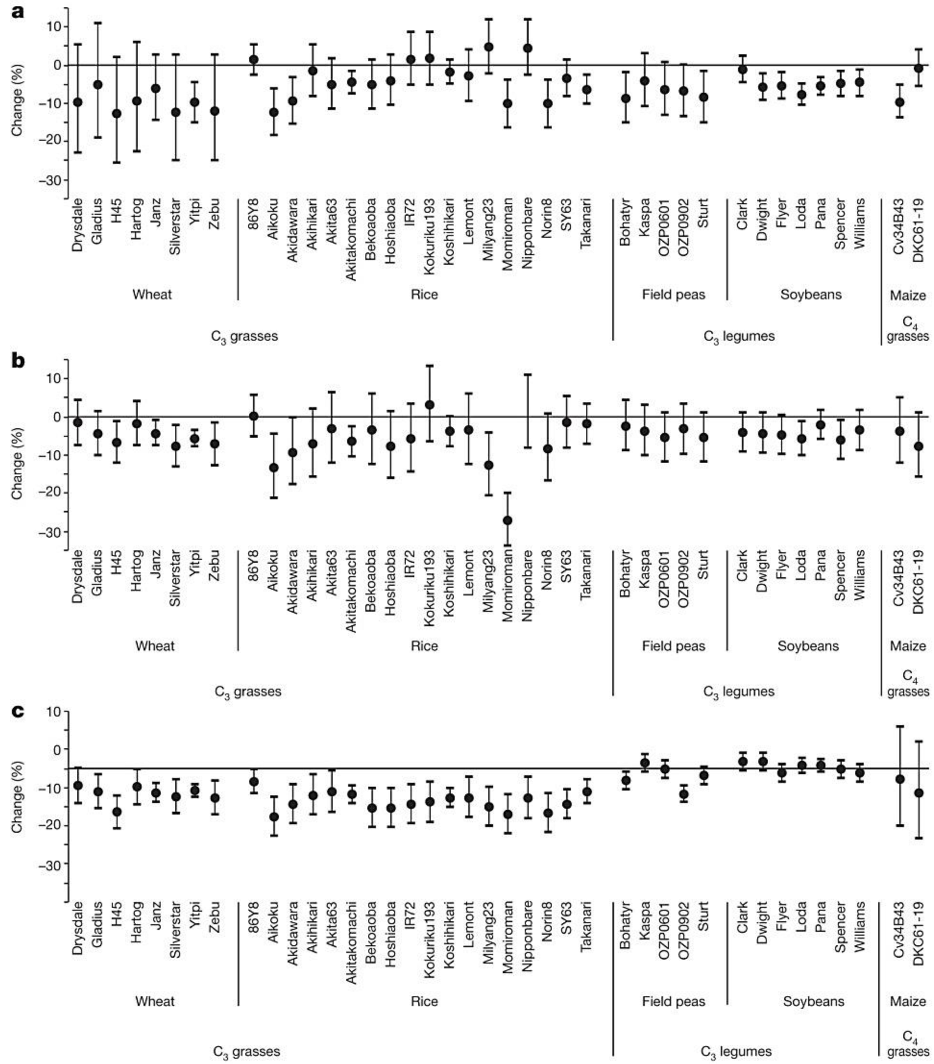
Activity 1: Handout Fig. 2

Figure 2: Percentage change (with 95% confidence intervals) in nutrients at elevated $[CO_2]$ relative to ambient $[CO_2]$, by cultivar.

a, Zinc;

b, iron

c, protein.

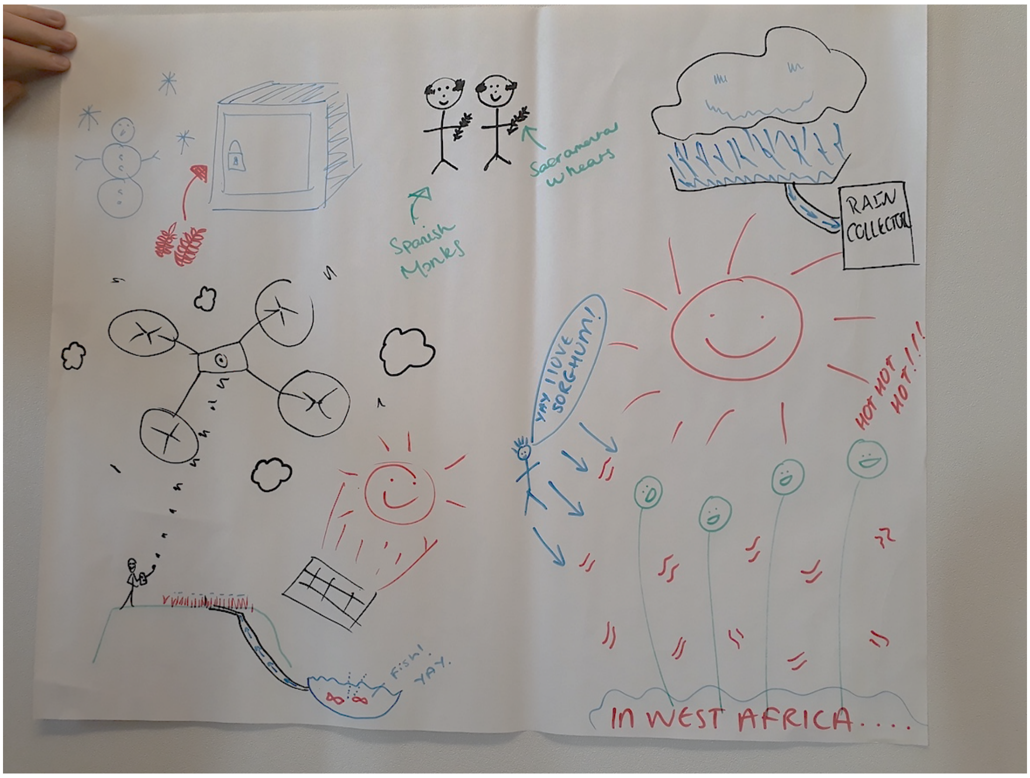


Myers, S. *et al.* Increasing CO_2 threatens human nutrition. *Nature* **510,** 139–142 (2014). https://doi.org/10.1038/nature13179

Activity 2: "Pictograms of climate-smart agriculture solutions"

1. Create a pictogram poster of CSA solution(s) from your chosen news article(s).

2. Groups will show and explain to class their pictogram poster



Example pictogram

Example CSA news articles handouts

https://www.thepatriot.co.zw/old_posts/drip-irrigation-way-to-go-mitigating-erratic-rainfall-effects/ accessed April 2021

Home › Old_Posts › Drip irrigation way to go...mitigating erratic rainfall effects

Old_Posts

Drip irrigation way to go...mitigating erratic rainfall effects

By **Shingirai Mutonho** - May 10, 2018

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FARMERS should invest in drip irrigation to mitigate the effects of the shifting rainfall patterns that have resulted in the country experiencing erratic rains during summer, an official has said.

Drip irrigation is a method that uses narrow tubes to deliver water directly to the base of a plant, allowing it to drip slowly to the roots.

Mashonaland West AGRITEX official Emmanuel Mandaza said drip irrigation mitigated water shortages.

Mandaza was addressing farmers during a tour of drip irrigation demonstration plots in Beatrice recently.

"Climate change is inevitable and the effects are already evident in Zimbabwe, hence the need for us to resort to other effective and sustainable farming methods like drip irrigation," he said.

Mandaza said, through adoption of drip farming method, the country was destined to yield at least 10t/ha of grain.

McCouch, S., Baute, G., Bradeen, J. *et al.* Feeding the future. *Nature* **499,** 23–24 (2013).
https://doi.org/10.1038/499023a

COMMENT

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The International Center for Tropical Agriculture in Colombia holds 65,000 crop samples from 141 countries.

Feeding the future

We must mine the biodiversity in seed banks to help to overcome food shortages, urge **Susan McCouch** and colleagues.

Humanity depends on fewer than a dozen of the approximately 300,000 species of flowering plants for 80% of its caloric intake. And we capitalize on only a fraction of the genetic diversity that resides within each of these species. This is not enough to support our food system in the future. Food availability must double in the next 25 years to keep pace with population and income growth around the world. Already, food-production systems are precarious in the face of intensifying demand, climate change, soil degradation and water and land shortages.

Farmers have saved the seeds of hundreds of crop species and hundreds of thousands of 'primitive' varieties (local domesticates called landraces), as well as the wild relatives of crop species and modern varieties no longer in use. These are stored in more than 1,700 gene banks worldwide. Maintaining the 11 international gene-bank collections alone costs about US$18 million a year.

The biodiversity stored in gene banks fuels advances in plant breeding, generates billions of dollars in profits, and saves many lives. For example, crossbreeding a single wild species of rice, *Oryza nivara*, which was found after screening more than 6,000 seed-bank accessions, has provided protection against grassy stunt virus disease in almost all tropical rice varieties in Asia for the past 36 years[1]. During the green revolution, high-yielding rice and wheat varieties turned India into a net food exporter. By 1997, the world economy had accrued annual benefits of approximately $115 billion from the use of crop wild relatives[2] as sources of environmental resilience and resistance to pests and diseases.

The time is ripe for an effort to harness the full power of biodiversity to feed the world. Plant scientists must efficiently and systematically domesticate new crops and increase the productivity and sustainability of current crop-production systems.

Why does plant breeding need a boost? Because new, high-yielding seeds that are adapted for future conditions are a cornerstone of sustainable, intensified food production[3]. Since the mid-1990s, progress in conventional plant breeding has ▶

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https://www.irri.org/climate-change-ready-rice
accessed April 2021

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Climate change - ready rice

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IRRI is developing rice varieties that can withstand conditions forecast to become more frequent and intense with climate change. This includes drought, flood, heat, cold, and soil problems like high salt and iron toxicity.

Environmental stresses constrain rice production, affecting about 30% of the 700 million poor in Asia alone who live in rainfed rice-growing areas. These stresses can be caused by extreme climatic changes like drought, flooding, or rising sea levels. While some can be inherent like high iron toxicity in the soil. Our breeding programs aim to develop rice types that can survive in these harsh environments.